

| Bacteria species                                              | Habitat                                                                                               | Antigenic structure                                                                                                                                                       | Source of infection  | Transmission mode                                                                                                                                | Disease                                                                                                                                                                                                                                                                                                                                                                                                                    | Treatment and Prevention                                                                                                                                                                                                                                                                                                                                                                                                                                               |
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| 1.Staphylococcus aureu (gram-positive cocci in cluster-shape) | As normal flora :<br>Oropharynx 90%<br>Skin 10%<br><br>Also found in<br>Nose & vagina<br>as carriage. | <ul style="list-style-type: none"> <li>• Protein A.</li> <li>• Teichoic acid.</li> <li>• Surface receptors.</li> <li>• Microcapsule.</li> <li>• peptidoglycan.</li> </ul> | Pure human infection | <p>Contact with human lesions or their contaminated fomites.</p> <p>Contaminated food with poison of the bacteria (not the bacteria itself).</p> | <p>Inflammatory – induced:</p> <ol style="list-style-type: none"> <li>1.Skin infection</li> <li>2.Septicemia</li> <li>3.Acute bacterial endocarditis</li> <li>4.Osteomyelitis and arthritis</li> <li>5.Pneumonia</li> <li>6. Metastatic abscesses</li> </ol> <p>Toxin-mediated:</p> <ol style="list-style-type: none"> <li>1. Food poisoning</li> <li>2. Toxic shock syndrome</li> <li>3. Scalded-skin syndrome</li> </ol> | <p>Treatment:</p> <ul style="list-style-type: none"> <li>• Augmentin (Amoxicillin + clavulenic acid).</li> <li>• Nafcillin.</li> <li>• Cefazolin.</li> <li>• Vancomycin.</li> </ul> <p>Prevention:</p> <ul style="list-style-type: none"> <li>• Cleanliness.</li> <li>• Proper cooking of food.</li> <li>• Aseptic management of lesions.</li> <li>• Ciprofloxacin for people with persistent colonies in nose.</li> <li>• Giving Cefazolin preoperatively.</li> </ul> |

- Bacteria are smart organisms, walling-off themselves by coagulase until they detect a suitable time where the body immunologic responses are in minimum activity. Then they initiate the lyses of the clot to disseminate through the circulation.
- Infective food-poisoning is caused by GIT bacteria secreting toxins and enzymes in the GIT itself, while Toxic food-poisoning is caused by bacteria secreting toxins in food (ex-vivo).

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| Neisseria meningitidis (gram-negative diplococcic) | Nasopharynx.<br><br>Upper respiratory tract. | Polysaccharide capsule.<br><br>IgA protease.<br><br>Lipopolysaccharide LPS (endotoxin). | Pure human infection:<br>-Carriers<br><br>-Patients | Airborne droplets | <p>Meningococemia:</p> <ul style="list-style-type: none"> <li>• Circulatory collapse (hypotension).</li> <li>• High fever.</li> <li>• Haemorrhagic purpura.</li> <li>• Bleeding.</li> <li>• Disseminated intravascular coagulation (DIC).</li> <li>• Waterhouse–Friderichsen syndrome (compication).</li> </ul> <p>Meningococcal meningitis:</p> <ul style="list-style-type: none"> <li>• Intense headache.</li> <li>• Vomiting.</li> <li>• Delirium &amp; convulsions.</li> <li>• Stiff neck.</li> <li>• Coma.*</li> <li>• Thrombosis of blood vessels.</li> <li>• Meninges is covered with thick-purulent exudates.</li> </ul> | <p>Treatment:</p> <p>Penicillin G → patients<br/>Ciprofloxacin → carriers</p> <p>Prevention:</p> <p>1.Vaccines:</p> <ul style="list-style-type: none"> <li>• Monovalent vaccine.</li> <li>• Bivalent vaccine.</li> <li>• Polyvalent vaccine.</li> </ul> <p>2.Chemoprophylaxes:</p> <ul style="list-style-type: none"> <li>• Rifampicin or Ciprofloxacin.</li> <li>• Respiratory control (masks)</li> </ul> <p>3.Immediate isolation and treatment of patients to avoid epidemicity</p> |

**\*Positive Kernig's sign, positive Brudzinski's sign and head retraction helps in attributing the cause of come to meningococcal origins.**

- **Waterhouse–Friderichsen syndrome** is characterized by adrenal gland failure and might be due to other than meningococcal bacteria such as: **Staphylococcus aureus**, **Mycobacterium tuberculosis** or **pseudomonas aeruginosa**.
- **Complications include:** 1. Ischemia (necrotic tissue damage)      2. Extensive bleedings      3. Brain lesion      4. Eye lesion  
5. Ear lesion      6. Nephritis      7. Arthritis      8. Waterhouse–Friderichsen syndrome

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| Neisseria gonorrhea (gram-negative diplococci) | Mucosa of: Urethra, Cervix, Pharynx, Conjunctiva. | <ul style="list-style-type: none"> <li>• Pilli : (for attachment to mucos membranes, highly antigenic, shows antigenic variations, antiphagocytosis)</li> <li>• Outer membrane proteins OMP: (for attachment and antiphagocytic activity).</li> <li>• Lipo-oligo-sacharide LOS (endotoxin).</li> </ul> | Pure human infection:<br>-Asymptomatic patients (mostly female)<br><br>-Patients (female or male) | Mainly by Sexual intercourse.<br><br>During delivery. | 1.Gonorrhea:<br>In male: <ul style="list-style-type: none"> <li>• Yellowish thick urethral discharge.</li> <li>• Frequency of micturation and dysuria.</li> </ul> In female: <ul style="list-style-type: none"> <li>• Green-yellowish cervical discharge accompany the intermenstrual bleeding.</li> </ul> 2.Rectal infection: <ul style="list-style-type: none"> <li>• Ulcer and purulent discharge.</li> <li>• Constipation &amp; painful defecation.</li> </ul> 3.Pharangitis: similar to viral or streptococcal sore throat.           4.Ophthalmia neonatorum.           5.Bacterimia rarely occurs leading to arthritis. | Treatment:<br>Ceftriaxon & Ciprofloxacin.<br><br>Prevention: <ul style="list-style-type: none"> <li>• Avoiding illegal sexual intercourse. (as known in Islamic constitutions)</li> <li>• Silver nitrate or Erythromycin (eye-drops) for newborn to prevent Neonatal conjunctivitis.</li> <li>• Detecting and tracing of cases for disease control.</li> <li>• No vaccine available.</li> </ul> |

- The pilli divide the gonococci into many serotypes due to their antigenicity.
- Reduced Modified protein (RMP) is one of the OMP which stimulates antibodies that block the bactericidal activity of serum against gonococci, and of anti-RMP antibiotics.
- Complications include: 1.Pelvic inflammatory disease (PID) and its serious form (salpangitis) in female  
2.Epididymitis, prostatitis and water-can perineum in male.

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| Escherichia coli (gram-negative bacilli) | Large intestine of human and other mammals (cattle) | <ul style="list-style-type: none"> <li>• Pilli</li> <li>• LPS containing the O-somatic antigens (endotoxin)</li> <li>• Flagella containing H-flagellar antigens (motility)</li> <li>• Capsule containing K-capsular antigens (antiphagocytotic)</li> </ul> | <ul style="list-style-type: none"> <li>• Human</li> <li>• cattle</li> </ul> | <ul style="list-style-type: none"> <li>• Faecal-oral route.</li> <li>• Contaminated food and water.</li> <li>• Undercooked beef meat.</li> </ul> | <p>Intestinal diseases:</p> <ol style="list-style-type: none"> <li>1. Traveler's diarrhea caused by Enterotoxigenic E. coli (ETEC) and Enterotoxin-producing E. coli (EAEC).</li> <li>2. Infant diarrhea caused by Enteropathogenic E. coli (EPEC).</li> <li>3. Haemorrhagic colitis (bloody diarrhea) caused by Enterohemorrhagic E. coli (EHEC).</li> <li>4. Dysentery-like syndrome (bloody stool with fever) caused by Enteroinvasive E. coli (EIEC).</li> </ol> <p>Extra-intestinal diseases:</p> <ol style="list-style-type: none"> <li>1. Urinary tract infection (UTI) including cystitis and pyelonephritis.</li> <li>2. Neonatal Meningitis.</li> <li>3. Septicemia and endotoxin shock.</li> <li>4. wound infections.</li> <li>5. Ear infections.</li> </ol> | <p>In case of intestinal disease :</p> <p>Fluid and electrolytes compensation.<br/>(No antibiotics required).</p> <p>In case of extra-intestinal disease:</p> <p>Ciprofloxacin and cefotaxim.</p> <p>Prevention:</p> <ul style="list-style-type: none"> <li>• Personal hygiene.</li> <li>• Taking care in selection, preparation and consumption of food and water.</li> </ul> |

- Hemorrhagic-Uremic-Syndrome caused by (EHEC) results in :
  1. Acute renal failure.
  2. Hemolytic anaemia.
  3. Thrombocytopenia.
- E. coli acquire both types of toxins:
  1. Endotoxin.
  2. Exotoxins:
    - Verotoxin.
    - Heat-stable toxin.
    - Heat-labile toxin (LT)(identical to cholera toxin).

| Bacteria species                              | Habitat                       | Antigenic structure                                                                                                                                                                                                                                 | Source of infection                                                                                          | Transmission mode                                                                                           | Disease                                                                                                                                                                                                                                                                                                                                                                                                                                      | Treatment                                                             |
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| Gram-negative bacilli:<br>1. Salmonella typhi | Gastro-intestinal tract (GIT) | <ul style="list-style-type: none"><li>• LPS containing the O-somatic antigens (endotoxin)</li><li>• Flagella containing H2 (non-specific) and H1 (specific) antigens.</li><li>• Capsule containing K-capsular antigens (virulence factor)</li></ul> | S. typhi is a pure human infection unlike other salmonellae.                                                 | <ul style="list-style-type: none"><li>• Faecal-oral route.</li><li>• Contaminated food and water.</li></ul> | Enteric fever: <ul style="list-style-type: none"><li>• 1<sup>st</sup>-2<sup>nd</sup> week: fever, headache, malaise, constipation, epistaxis, bradycardia, leucopenia, hepatosplenomegaly, abdominal pain and rose-spots on skin.</li><li>• 3<sup>rd</sup> week: bloody diarrhea.</li><li>• 4<sup>th</sup> week: Intestinal hemorrhage &amp; perforation .</li></ul> Carrier disease: in gallbladder, biliary tract, L-forms in bone marrow. | Chloramphenicol or Ceftriaxon & ciprofloxacin.                        |
| 2. Salmonella paratyphi A&B                   |                               |                                                                                                                                                                                                                                                     | Human (carrier) is the chief source for the majority of salmonellae with animals constitute the (reservoir). |                                                                                                             | Paratyphoid fever: more irritation to intestine, less severe with mild symptoms.                                                                                                                                                                                                                                                                                                                                                             | Ampicillin, Amoxicillin or Ciprofloxacin. Cholecystectomy (if needed) |
| 3. Salmonella paratyphi C                     |                               |                                                                                                                                                                                                                                                     |                                                                                                              |                                                                                                             | Septicemia: fever, metastatic abscesses esp. in bones, no GIT symptoms. Paratyphoid fever.                                                                                                                                                                                                                                                                                                                                                   | or Aziththromycin.                                                    |
| 4. Salmonella minor group                     |                               |                                                                                                                                                                                                                                                     |                                                                                                              |                                                                                                             | Food poisoning (also called Salmonellosis, Enterocolitis or Gastroenteritis): watery diarrhea. S. choleraesuis: may cause septicemia with focal lesions.                                                                                                                                                                                                                                                                                     | Correction of fluid and electrolytes.                                 |

- Prevention includes personal hygiene, sanitation and taking care in food handling.
- Effective vaccines are still researched.

| Bacteria species                                                                                                                                                  | Habitat                             | Antigenic structure                                                                                                                                                                                             | Source of infection                   | Transmission mode                                                                                              | Disease                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Treatment and Prevention                                                                                                                                                                                                                                                                                                                                                           |
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| Shigellae (short gram-negative bacilli)<br>*S. dysenteriae (esp. S. shigae)<br>*S. flexneri<br>*S. boydii<br>*S. sonnei<br>their severity decreases respectively. | Large intestine (no blood invasion) | <ul style="list-style-type: none"> <li>• LPS containing the O-somatic antigens (endotoxin)</li> <li>• Capsule containing K-capsular antigens (antiphagocytotic).</li> <li>• No H-flagellar antigens.</li> </ul> | Man (carrier)<br>Pure human infection | <ul style="list-style-type: none"> <li>• Faecal-oral route.</li> <li>• Contaminated food and water.</li> </ul> | Shigellosis (Bacillary dysentery):<br>1 <sup>st</sup> phase: <ul style="list-style-type: none"> <li>• Abdominal cramps with pain.</li> <li>• Watery diarrhea.</li> <li>• Fever (sometimes).</li> <li>• Generalized myalgias.</li> </ul> 2 <sup>nd</sup> phase: <ul style="list-style-type: none"> <li>• True dysentery.</li> <li>• Decreased volume of stool.</li> <li>• Bright-red blood with mucus in stool.</li> <li>• Tenesmus.</li> <li>• Anorexia.</li> <li>• Fever (rarely)</li> </ul> | Ampicillin<br>Tetracycline<br>Co-trimoxazole which is (Trimethoprim+sulfamethoxazole)<br><br>But in case of S. shigae, it is sensitive only to:<br>1.Nalidixic acid.<br>2.Ciprofloxacin + Gentamycin.<br>3.Norfloxacin + Amikacin.<br><br>Prevention includes personal hygiene, sanitation and taking care in food handling (esp. periodic bacteriological examination of cookers) |

The exotoxin of Shigella acts as : 1. The verotoxin (enterotoxin) of E. coli affecting the GIT (hemorrhagic colitis).

2. a Neurotoxin affecting the CNS (Meningismus and coma).

| Bacteria species                                                 | Habitat            | Antigenic structure & virulence factors                                                                                                                                                                                                                                                                                                                                                                                                                              | Source of infection & Transmission                                                                                              | Disease                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Treatment and Prevention                                                                                                                                                                                                                                 |
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| Gram-positive cocci in chains<br><i>Streptococcus pyogenes</i> : | Skin<br>Oropharynx | <ul style="list-style-type: none"> <li>Polysaccharide capsule.</li> <li>M protein.</li> <li>C carbohydrate.</li> <li>Enzymes:               <ol style="list-style-type: none"> <li>Streptokinase</li> <li>DNase</li> <li>Hyaluronidase</li> </ol> </li> <li>Toxins:               <ol style="list-style-type: none"> <li>Erythrogenic T</li> <li>Streptolysin O</li> <li>Streptolysin S</li> <li>Pyrogenic exotoxin (A)</li> <li>Exotoxin (B)</li> </ol> </li> </ul> | Most streptococci are part of the normal flora of the human but they produce disease when they gain access to tissues or blood. | <p>Inflammatory-induced diseases:</p> <ul style="list-style-type: none"> <li>Pharyngitis:               <ol style="list-style-type: none"> <li>Inflammation.</li> <li>Fever.</li> <li>Purulent exudates on tonsils.</li> <li>Leukocytosis.</li> <li>Tender lymph nodes.</li> </ol> </li> <li>Cellulitis, erysipelas and impetigo.</li> <li>Necrotizing fasciitis.</li> <li>Bacteremia and lymphangitis.</li> <li>Endometritis and sepsis (puerperal fever)</li> </ul> <p>Toxin-mediated disease:</p> <ul style="list-style-type: none"> <li>Scarlet fever (due to erythrogenic toxin):               <ol style="list-style-type: none"> <li>Acute nasopharyngitis</li> <li>Acute tonsillitis</li> <li>High fever</li> <li>Body rash</li> </ol> </li> <li>Streptococcal toxic shock syndrome (due to pyrogenic toxin A):               <ol style="list-style-type: none"> <li>High fever.</li> <li>Shock.</li> </ol> </li> </ul> <p>Immunologic diseases:</p> <ul style="list-style-type: none"> <li>Acute glomerulonephritis (usually following cellulitis):               <ol style="list-style-type: none"> <li>Hypertension</li> <li>Smoky urine.</li> <li>Oedema of face (esp. periorbitally)</li> </ol> </li> <li>Acute rheumatic fever (usually following pharyngitis):               <ol style="list-style-type: none"> <li>High fever</li> <li>Carditis</li> <li>Migratory polyarthrititis</li> </ol> </li> </ul> | <p>Treatment:</p> <ul style="list-style-type: none"> <li>Pencillin G</li> <li>Erythromycin</li> </ul> <p>Prevention:</p> <ul style="list-style-type: none"> <li>No vaccine available</li> <li>Prompt treatment of pharyngitis and cellulitis.</li> </ul> |

| Bacteria species                                               | Habitat                                  | Antigenic structure & virulence factors                                                                                                 | Source of infection & Transmission                                                                                                                                                                   | Disease                                                                                                                                                                                                                      | Treatment and Prevention                                                                                                                                                                                                                                                                                                                     |
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| Gram-positive cocci in chains<br><i>Streptococcus agalacti</i> | Female genital tract in Human and cattle | <ul style="list-style-type: none"> <li>• Polysaccharide capsule.</li> <li>• C carbohydrate.</li> <li>• No enzymes or toxins.</li> </ul> | <p>Most streptococci are part of the normal flora of the human but they produce disease when they gain access to tissues or blood.</p> <p><i>Strept. agalacti</i> is transmitted during delivery</p> | <ol style="list-style-type: none"> <li>1. Neonatal sepsis and meningitis.</li> <li>2. Pneumonia.</li> <li>3. Endocarditis.</li> <li>4. Arthritis.</li> <li>5. Osteomyelitis.</li> <li>6. Postpartum endometritis.</li> </ol> | <p>Treatment:</p> <ul style="list-style-type: none"> <li>• Penicillin G (combined with gentamycin if needed)</li> </ul> <p>Prevention:</p> <ul style="list-style-type: none"> <li>• Parenteral ampicillin perinatally to women who experience predisposing factors.</li> <li>• Oral ampicillin to women who are vaginal carriers.</li> </ul> |
| Viridians Streptococci                                         | Oral cavity and colon                    | <ul style="list-style-type: none"> <li>• Polysaccharide capsule.</li> </ul>                                                             | <ul style="list-style-type: none"> <li>• Recurrent injury of mouth.</li> <li>• Dental surgery without prophylaxis.</li> </ul>                                                                        | <p>Subacute bacterial endocarditis:</p> <ul style="list-style-type: none"> <li>• Fever</li> <li>• Anaemia</li> <li>• Heart murmur</li> <li>• Embolic events</li> </ul> <p>Dental caries (<i>S. mutans</i>)</p>               | <p>Penicillin G (prolonged treatment)</p> <p>Prevention:<br/>Chemoprophylaxis with amoxicillin perioperatively.</p>                                                                                                                                                                                                                          |
| Peptostreptococci                                              | GIT and female genital tract             | <ul style="list-style-type: none"> <li>• Polysaccharide capsule.</li> </ul>                                                             | Produce disease when they gain access to tissues or blood.                                                                                                                                           | Mixed anaerobic infection of abdomen, pelvis, lungs and brain (abscesses)                                                                                                                                                    | Penicillin G                                                                                                                                                                                                                                                                                                                                 |
| <i>Streptococcus bovis</i>                                     | GIT of human and animals                 | <ul style="list-style-type: none"> <li>• Polysaccharide capsule.</li> </ul>                                                             |                                                                                                                                                                                                      | Associated with endocarditis and colorectal cancer (carcinoma of colon)                                                                                                                                                      | Penicillin G                                                                                                                                                                                                                                                                                                                                 |
| Enterococci ( <i>Streptococcus faecalis</i> )                  | In the intestine                         | <ul style="list-style-type: none"> <li>• Polysaccharide capsule.</li> </ul>                                                             |                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Urinary tract infection.</li> <li>• Endocarditis.</li> <li>• Intra-abdominal and pelvic infections.</li> </ul>                                                                      | <ul style="list-style-type: none"> <li>• Resistant to penicillin and aminoglycosides.</li> <li>• Vancomycin is effective against some strains.</li> <li>• Vancomycin resistant enterococci (VRE) are treated with Linezolid.</li> </ul>                                                                                                      |